

## CHAPTER 7

## DISTRIBUTION SYSTEM DESIGN DETAILS

7-1. Minimum pipe cover. Minimum cover over pipes will be 2-1/2 feet in grassed areas, 3 feet under unpaved driveways or roadways, and 4 feet under railroad tracks. Where frost depths are greater than the above minimums, the cover should be at least equal to the frost depth, particularly for small lines which may not be flowing continuously. Where lines pass under railroads, pipes may be encased in concrete or enclosed in rigid conduit. Installation of pipelines and conduits under railroad main lines is usually accomplished by carefully controlled tunneling and jacking. For branch lines or lines used infrequently, open cut installation may be permitted by the railroad. Jacking or tunneling procedures are usually required if a pipeline is to be installed under a major roadway with no disruption of traffic.

7-2. Protection of items penetrating the frost zone. Water distribution equipment items penetrating the frost zone are sometimes subject to freezing if protective measures are not taken.

a. Air vent and vacuum relief valves. These items can be protected from freezing by installation in pits deep enough to place the valves below the frost zone.

b. Blowoff valves. Blowoff valves should be installed at depths below the frost zone. If terrain conditions permit, the drain line from a blowoff valve should go to a nearby low surface area to allow gravity drainage. The valve discharge must be piped to the atmosphere and provide drainage from the line to the outlet side of the valve. If gravity drainage cannot be provided, the blowoff valve should be provided a tee, with foot valve to prevent backflow, discharging into a dry well below the frost line.

c. Fire hydrants. Fire hydrants penetrating the frost zone will be of the dry-barrel variety (para 5-2). Free draining backfill will be placed around the barrel to prevent frost-heave due to moisture around the barrel in the frost zone.

d. Post indicator valves. Freezing should not be a problem with post indicator valves and valve boxes if they are constructed and maintained so that water does not collect in or around them.

7-3. Disinfection of water supply systems. New distribution mains and existing distribution piping affected by construction may be sources of water supply contamination. Therefore, disinfection of new and connecting work is required. The procedures set forth in AWWA C601 for disinfection must be followed.

7-4. External corrosion.

a. Corrosion of the external surfaces of cast-iron or steel pipes can, under some conditions, be a significant problem. Therefore, ductile-iron or steel pipelines placed in aggressive soils must be protected by coatings of coal-tar, polyethylene encasement or cement mortar. Cement mortar coatings may be applied by mechanical or pneumatic means.

b. The characteristics of the soil in which a pipe is placed affect the rates of corrosion, with the most corrosive soils being those having poor aeration and high values for acidity, electrical conductivity, dissolved solids, and moisture content. The relative potential for corrosion may be estimated by evaluating the degree of corrosion of pipelines or other metallic objects previously buried in that soil.

c. In locations where the soils are known to be very corrosive, it may be desirable to use cathodic protection systems as a supplement to (but not in place of) the above coatings.

d. Another method of avoiding corrosion of distribution mains is through the use of nonmetallic pipe materials such as asbestos-cement, reinforced concrete, or plastic.

7-5. Thrust blocking. Criteria for determining the magnitudes of thrusts and the relative need for thrust blocking or anchorage are given in appendix C.

7-6. Layout map. An up-to-date layout map, to a suitable scale, showing the entire distribution system involved in the design will be maintained.

7-7. Design analysis. The design analysis will indicate the essential elements used in determining sizes and locations of mains, including:

- Projected populations and areas in which the populations are located
- Locations and magnitudes of special water demands
- Location and magnitude of fire demands
- Location and size of pump stations
- Storage input
- Water treatment plant or other input sources